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**BIOLOGICAL EVALUATION  
OF GYPSY MOTH POPULATIONS,  
MONONGAHELA NATIONAL FOREST, WEST VIRGINIA  
1993**

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# **BIOLOGICAL EVALUATION OF GYPSY MOTH POPULATIONS MONONGAHELA NATIONAL FOREST, WEST VIRGINIA 1993**

## **SUMMARY**

The gypsy moth, *Lymantria dispar* (Linnaeus), caused slightly less defoliation this year than last (5,362 acres in 1993 vs. 6,499 acres in 1992) and was again restricted to the northern portions of the Potomac Ranger District (RD), Monongahela National Forest (MNF).

A strategy for gypsy moth integrated pest management (GMIPM) had been developed and implemented for the MNF in 1992. This document presents the strategy for its implementation in 1993 and the results of the evaluation. The biological situation is presented concerning the current gypsy moth infestations and what impact they are likely to have on the management of the MNF's traditional resources of timber, wildlife and recreation, and on non-traditional resources values of ecosystem biodiversity.

This biological evaluation used gypsy moth egg mass surveys conducted from August to December 1993 to determine the current population densities in forest stands of susceptible oak type on the Cheat, Greenbrier and Potomac RDs. Survey results provide the basis for predicting where gypsy moth infestations in 1994 would exceed each of the three damage thresholds for nuisance, defoliation, and growth loss-tree mortality.

Criteria for establishing treatment units to reduce the threat of defoliation to the resources were identified jointly by MNF and Forest Health Protection (FHP) personnel. The intent was to determine where gypsy moth infestations would cause the greatest impacts to the National Forest resource values and uses during the next growing season.

Two proposed treatment alternatives were developed through NEPA scoping. Treatments involve aerially spraying biological insecticides in May 1994 for the following reasons: 1) to prevent nuisance and aesthetic loss in developed recreation areas; 2) to reduce tree mortality and maintain wildlife habitat where management goals are timber and wildlife oriented; 3) to enhance visual quality for dispersed recreation; and, 4) to promote biodiversity through protecting forest health.

## **INTRODUCTION AND BACKGROUND**

Gypsy moth defoliation during 1993 is shown in the context of the entire state of West Virginia to relate the infestation on the MNF to the remainder of West Virginia (Map 1). Moderate forest defoliation by the gypsy moth has existed on the MNF for at least the last two years based on aerial sketchmapping information (Map 2). About the same extent of defoliation occurred in both 1993 and 1992. There have been no forest damage surveys to quantify tree mortality resulting from this infestation. However, in similar susceptible oak forests in Pennsylvania, Maryland, Virginia, and the eastern panhandle of West Virginia, gypsy moth infestations have caused substantial oak mortality. Impacts on timber production as well as the permanent alteration of forest stand structure for wildlife habitat and biodiversity also have been documented by research and management in these states. The adverse impacts of larval nuisance, defoliation, and tree mortality on developed recreation sites also have been documented.

## **OBJECTIVES**

The objectives of this biological evaluation within the context of GMIPM were to: 1) generally estimate gypsy moth population densities within the susceptible forest types of the Cheat, Greenbrier and Potomac RDs; 2)

reasonably predict how the damage caused by those populations would impact forest resources during the next growing season; and, 3) develop environmentally responsible and economically feasible management tactics to suppress those populations posing the greatest risk to national forest resource values and uses while maintaining habitat and species diversity.

## **SURVEY PROCEDURES**

The following approach to GMIPM was developed for the MNF in FY 1993 by Bob Acciavatti, FHP-Morgantown, and presented at the Potomac RD on Wednesday, November 18, 1992. The approach is based on the white paper entitled "Post AIPM Gypsy Moth Management within the Proclamation Boundary of the Monongahela National Forest", jointly agreed to by R-9, MNF and NA, FHP on September 28, 1992, at Elkins, WV. Presentation of GMIPM in this report is necessary for documenting this approach as additional Ranger Districts become involved with management decisions to deal with gypsy moth infestations.

### **GMIPM Strategy and Procedures**

1. The 1993 aerial sketchmapping survey by Jerry Judy, West Virginia Department of Agriculture field agent, located gypsy moth populations at outbreak densities that had defoliated the MNF forests. Portions of the three northernmost MNF RDs were considered for GMIPM in FY 1994 as follows:

Cheat RD - Horseshoe Run; northeast of Parsons; east side Shavers Fork  
north of Stuart Park

Greenbrier RD - Upper East Fork of Greenbrier River

Potomac RD - Spruce Knob-Seneca Rocks NRA; Grassy Mountain

2. Surveys determined where the most susceptible gypsy moth host tree species (oaks) predominate in compartments with management goals of timber (3.0), wildlife habitat (6.1), dispersed recreation with salvage only (6.2), and developed recreation areas. For each surveyed RD, these were:

Cheat RD - 6 compartments, 4 recreation areas;

Greenbrier RD - 1 compartment, 4 recreation areas;

Potomac RD - 28 compartments, 4 campgrounds.

3. Dave Curry, FHP cooperative agreement employee, and John Cassidy, MNF contract employee, under the supervision of Bob Acciavatti, established a variable number of 1/40-acre survey plots within the areas described above. The plots were randomly placed in each surveyed compartment, between August 15 and December 15, 1993.

At each survey plot, the following data were recorded:

- \* the number of new and old gypsy moth egg masses;
- \* the estimated percentage of oak trees on plot and in surrounding stand;
- \* the egg mass size for new egg masses;
- \* the presence of *Ooencyrtus* parasitic wasps on egg masses;
- \* the dead larvae killed by virus (NPV) and *Entomophaga* fungus.

4. FHP used the regression curve of gypsy moth host type defoliation resulting from gypsy moth egg mass densities as published by NEFES, Radnor, PA. Damage thresholds to be expected from the defoliation, as established under GMIPM, indicated what forest resources values and uses (set as the highest four priorities for protection in the MNF Gypsy Moth Management White Paper) would be impacted by this damage. The following chart presents these gypsy moth egg mass density/damage/impact thresholds:

### GYPSY MOTH DAMAGE AND IMPACT CHART

Gypsy Moth EM/Plot	Gypsy Moth EM/Acre	Forest Host Type Damage Threshold Class	Monongahela NF Forest Resources Impacted
0- 6	< 250	Minimal	None
7-12	250	Larval nuisance to people	Developed Recreation
13-24	500	Visible defoliation of 30-60%	T&ES; Mgt. 8; Class A visual, general forest; nearby private land; RNA
25+	1000 +	Growth loss and dead trees from complete defoliation	Timber sales and high quality sites; hard mast crop; habitat diversity

RNA = Research Natural Area; T&ES = Federally Threatened, Endangered, Sensitive

5. Survey data were interpreted in terms of Damage Threshold Classes which are based on research results and empirical observations as to the effect gypsy moth populations at various densities have on forest trees. For example, summer refoilation of a tree occurs after spring defoliation exceeds 40 percent causing depletion of food reserves. A tree may be able to recover from one refoilation, but it is unlikely it would recover from two successive years of this damage. These trees depleted of starch food reserves are highly vulnerable to attacks by phloem-feeding beetles, e.g. the two-lined chestnut borer, and infection by the Armillaria root rot fungus.
6. The 587 egg mass survey plot locations were displayed on 7.5-minute USGS Quads using the following color codes for each gypsy moth damage class to help visualize the potential damage locations/areas:
 

Green	MINIMAL
Yellow	LARVAL NUISANCE
Orange	VISIBLE DEFOLIATION
Pink	GROWTH LOSS/DEAD TREES
7. Based on the MNF Land Management Plan objectives for the Cheat, Greenbrier and Potomac RDs, decisions were made as to which locations/areas with potentially damaging gypsy moth populations posed the greatest threat to forest resources and uses. The following treatment decision criteria were utilized to establish which locations/areas would benefit most from suppression of gypsy moth populations in 1994:

## A Description of Proposed Treatment Unit Criteria for 1994 Suppression

- (1) New gypsy moth egg mass (EM) densities
  - (2) Gypsy moth defoliation 1992 and 1993
  - (3) Timber values and degree of vulnerability to mortality
  - (4) Highly sensitive developed/dispersed recreation and scenic areas
  - (5) State Cooperative County Landowner Program (CSCLP) spray block proximity for 1993 and 1994
  - (6) Spread of infestation out of USDA-APHIS Quarantine Areas into nearby forested areas of the Monongahela National Forest
  - (7) Retreatment of spray block treated during 1993 suppression project
8. Boundaries and acreage are determined by MNF and FHP for each proposed treatment unit to achieve maximum suppression of potentially damaging gypsy moth populations through contracting for aerial spraying in May 1994.
9. MNF notified the public(s) of the intent of the Forest to conduct a gypsy moth spray project. The scoping meetings help to further identify issues and concerns to be addressed in an EA and Decision Notice, and perhaps identify the need for an EIS beyond the current USDA/FS & APHIS EIS.
10. MNF and FHP will plan and organize a spray project using Incident Command System (ICS) to identify key team members and their responsibilities (develop project activities, schedules, contracting, and procurement of personnel, vehicles, aircraft, supplies, etc.).
11. FHP and MNF have established efficacy standards for gypsy moth suppression. A successful project:
  - 1) protects enough foliage (70 percent or more) to keep defoliation from being visibly detected and recorded remotely using aerial methods (sketchmapping/photography/videography flights) in July;
  - 2) reduces gypsy moth populations by 80 percent or more comparing egg mass densities of the generation spraying to that following;
  - 3) maintains residual gypsy moth populations below the threshold densities of 250 or 500 egg masses per acre established for the respective forest resources potentially impacted by gypsy moth damage.
12. FHP will evaluate the project against these standards and report the results. The Treatment Monitoring Data Base Protocols and Procedures will be followed for data collection, thereby permitting a standard for comparison with results from similar projects, and making it possible to determine reasons for success/failure on each treatment unit.
13. FHP will be responsible for non-target monitoring during the spring of spraying for selected invertebrates. Many macrolepidopterous moths are of special interest in determining biodiversity of ecosystems in the Spruce Knob-Seneca Rocks NRA. By surveying the moth fauna likely to be feeding and exposed to insecticides in the proposed treatment units during the time for spraying, FHP will document the presence and relative abundance of species considered to be of special concern for their rarity in West Virginia, and/or their listing as federally threatened, endangered, or sensitive. Numerous habitats will be surveyed from March to June with the cooperation of the West Virginia Division of Natural Resources and the Carnegie Museum of Natural History.

## RESULTS AND DISCUSSION

Table 1 shows the 1993 gypsy moth population densities and 1994 damage predictions for the Cheat, Greenbrier and Potomac RD compartments included in this biological evaluation. Maps 3 through 5 show where the surveyed compartments are located. The potential for moderate to severe defoliation in 1994 exists

within those compartments where the gypsy moth is most abundant. The measure of abundance used here is expressed as the percent of survey plots falling within the highest damage class of defoliation and growth loss/tree mortality.

Gypsy moth infestations exist at densities capable of causing damage by nuisance/defoliation/tree mortality in 13 of the 35 compartments surveyed. On the Cheat RD, 1 of 6 compartments is likely to have defoliation and the only compartment surveyed on the Greenbrier RD is not likely to have defoliation. In contrast, nearly half (12 of 28) of the Potomac RD compartments surveyed are likely to experience gypsy moth defoliation, resulting in unacceptable amounts of growth loss or tree mortality.

Gypsy moth populations in the recreation areas present a nuisance to users and threaten to cause defoliation in only three of the campgrounds surveyed.

Surveys elsewhere on these RDs indicate that gypsy moth populations were innocuous to non-existent and would not pose a threat to resources in 1994. The natural control factors operating in the infestations were not quantitatively surveyed for lack of time and personnel. Observations, however, indicated that gypsy moth egg mass size for new egg masses was moderate to large and there appeared to be a low incidence of *Ooencyrtus* parasitic wasps on the egg masses. There was minimal evidence of larvae killed by nucleopolyhedrosis virus and none of the dead larvae collected were found to be harboring resting spores of *Entomophaga* fungus. However, this fungus is known to be present east of the Allegheny Front on the Potomac RD, and was considered to have influenced the successful treatment of gypsy moth infestations sprayed in that area during May 1993.

GMIPM seeks to determine where values are at risk from the current gypsy moth infestations so that treatment units can be established for suppression considerations for 1994. Pre-, and post-suppression egg mass surveys determine gypsy moth population changes and provide a measure of project effectiveness. In addition, treatment evaluation and non-target lepidopteran monitoring with FHP coordination, insures assessments of forest health impacts resulting from gypsy moth management decisions to spray specified areas. Impacts include those to ecosystem biodiversity and non-target moths in habitats typical of the forest types considered for gypsy moth suppression in this and future years.

Potentially damaging gypsy moth populations exist in susceptible forest type within two and ten compartments of the Cheat and Potomac RDs respectively. Treatment units encompassing these gypsy moth infestations were jointly identified by the MNF and FHP as candidates for spraying to protect forest areas managed for timber, wildlife, recreation and ecosystem biodiversity. These treatment units are shown in Table 2 and Maps 6 through 9.

The gypsy moth infestations on the Cheat and Potomac RDs are located at the leading edge of the generally infested area. The recent history of gypsy moth infestations is one of expansion into this part of the MNF with abundant susceptible tree species. Considering these facts and the gypsy moth populations found during the surveys for this biological evaluation, FHP predicts that gypsy moth populations will continue to spread and build to outbreak densities on the MNF over the next several years in the general areas discussed in this report.

## **TREATMENT ALTERNATIVES**

The MNF has two gypsy moth management options in 1994 that are responsive to issues identified through NEPA scoping. For those treatment units with gypsy moth population densities above the thresholds of: 1) 250 egg masses per acre where recreation values and uses would be affected by larval nuisance and defoliation; 2) 500 and 1,000 egg masses per acre where moderate to severe defoliation could potentially result in permanent tree damage/loss of susceptible host type.

- 1) no action against the gypsy moth;
- 2) spray designated recreation areas with microbial insecticides to prevent nuisance, defoliation, and subsequent tree mortality;

If the no action alternative is chosen, pre-suppression population densities within the treatment units (Table 3) indicate that the potential exists for the gypsy moth to cause nuisance and moderate to severe defoliation in portions of the Cheat and Potomac RDs in 1994. The current gypsy moth infestations are in the leading edge of the generally infested area along the southward expansion of gypsy moth. It is under these circumstances that increased risks from the expanding outbreaks can most impact the forest by increasing tree mortality, especially in oak type, especially where stands have been defoliated during one or more previous years.

## **RECOMMENDATION**

We recommend the MNF give serious consideration to one of the spray treatment alternatives. National Forest resource values such as recreation, timber, wildlife, species biodiversity would be protected by suppressing building gypsy moth populations now rather than waiting until a large scale outbreak develops on the Cheat and Potomac RDs.